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INSTRUCTIONS ON PROCESSING

for Community Frozen-Food Locker Plants



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Preface

Interest in the preservation of foods by freezing and holding them at low temperatures has led to the establishment of many frozen-food locker plants throughout the country. This interest has spread to those progressive communities that already have canning plants operated on a community basis. By the addition of freezing facilities such communities plan to take advantage of both methods of food preservation.

With this increase in community locker plants has come a demand for accurate up-to-date information on what to freeze and how to prepare it. This publication has been issued to meet these requests. It is based on the latest and most reliable information obtainable from State agricultural experiment stations and the research laboratories of the United States Department of Agriculture. It has been written specifically for the supervisors of those plants where the patrons and volunteer groups prepare and package the produce at the plant. If these instructions are carefully followed a high-quality product, which will be found very desirable for use in both school lunches and family meals, should be obtained.

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Instructions on Processing for Community Frozen-Food Locker Plants

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PRESERVATION OF FOODS BY FREEZING

Expansion of facilities for the preservation of foods by freezing has been very rapid. The reason for this is chiefly because the public has found that freezing is by far the best way to preserve the fresh flavor and texture of the products. In addition, the natural color of the products is well preserved if proper care is taken in their processing. More important than flavor and color retention, however, is the preservation of the nutritional factors which cannot be seen or tasted but which are so necessary to the good health of everyone and to the proper development of growing children. The public is now vitamin conscious. Of all the methods of food preservation, freezing best preserves the vitamins. This does not mean, however, that there is no loss whatsoever in vitamin content, since there are some losses in preparation and cooking no matter what preservation methods are used.

In common with other methods of food preservation, freezing allows foods to be carried over from a time of plenty to a period of scarcity. It allows the farmer to butcher his animals when they are at the proper stage of growth rather than feed them until cold weather, thus effecting a saving in feed and providing fresh meat throughout the year.

Frozen foods offer the family a more interesting,

varied, and better-balanced diet. They also provide variety and balance for school lunches and other types of institutional feeding. Preparation of foods and their freezing usually involve less work than other methods of preservation.

In order to obtain the best use of a frozen-food locker it is necessary to have a definite plan of what is to be preserved by freezing and of how much of each kind of product is required to provide food for the family at all seasons of the year. A balance should be maintained between meat products and fruits and vegetables.

The most economical use of a locker requires that empty space be refilled with locally abundant foods whenever available. The rent is the same whether the locker is full or only partly so. Keep the food moving by using the oldest package first. Certain foods may be stored longer than others; some for 6 months, some for 12 months. For greatest satisfaction, use the food within the maximum recommended storage period. There should be no carry-over from one season to the next. It is a good plan to keep a record at home of what the locker contains and when each product was prepared. A duplicate list should be kept within the locker for checking foods in and out.

For those who live some distance from the locker plant, some form of home storage would be valuable since this would save trips to the locker and spread the availability of the frozen foods more evenly over a period of time.

Whenever possible preparation of foods for freezing should be done at the locker plant where adequate facilities usually are available for careful control. This insures a better product and hence a more satisfied patron. It should also be pointed out that when foods are prepared at the locker plant there need be no loss of time between preparation and freezing. This is very important. If it is necessary to prepare foods in the home for freezing at the locker plant some means should be provided whereby the prepared products may be kept cold during the time that elapses between their preparation and final freezing in order to prevent spoilage. The sooner the product is frozen, the better it will be.

Some fruits and vegetables, for one reason or another, have not proved satisfactory for freezing. They are listed here in order to avoid possible disappointment to those who try to freeze them.

Cantaloups	Lettuce
Celery	Parsley
Cress	Pears (whole)
Cucumbers	Radishes
Endive	Watermelon
Green onions	

Cubes or balls of cantaloup or watermelon may be frozen and used for decorative purposes in serving foods but this is not desirable when the locker could be used for more valuable food.

Vegetables which may be frozen but which are probably better preserved by some other method or used in the fresh state are:

Artichokes	Hot peppers
Cabbage	Potatoes (Irish)
Herbs	

It is not recommended that fruits be frozen whole. This is particularly true of clingstone peaches, grapes, and plums. The freezing of fresh tomatoes has not proved satisfactory owing to the fact that they do not hold their shape well on thawing.

If locker space permits, juices of the following fruits may be satisfactorily frozen and stored provided proper precautions are taken:

Apple	Raspberry
Dewberry	Strawberry
Grape	Tomato

Orange juice makes a very good frozen product but since it should be deaerated before freezing, a process which cannot be readily carried out at a locker plant, it is not recommended as a product for preparation by the locker patron.

It should also be pointed out that not all varieties of the same fruits and vegetables are of equal value for preservation by freezing. There are certain varieties of fruits which because of their flavor and texture are more suitable for the preparation of frozen products, than are other varieties. In most cases, the individual locker patron will freeze the variety which he grows or which is available in his community. If he has

more than one variety he may use the one most suitable for freezing. If only one variety is available it will give a good edible product if properly processed and there is no reason why it should not be frozen. Different kinds of the same vegetable give frozen products of variable quality. Since vegetables are annual crops it is not difficult to change to growing those which will give the better frozen product. For further information as to the varieties most suitable for your locality consult your State experiment station or State extension service.

Good garden varieties are often more suitable than commercial ones. Avoid dissatisfaction by using those known to be most desirable for preservation by freezing.

PREPARATION OF FRUITS FOR FREEZING

In order to obtain a first-class product only the best fruit should be used. No matter how careful the preparation and processing, the product will not be better than the raw material. Freezing will not improve a poor grade of fruit. Care should be taken to select fruit of the proper variety and maturity. All fruit when packed, therefore, should be fully ripe but firm, not mushy, and should be free from moldy or defective specimens. The stage of maturity best for eating out of hand is the best for frozen products. Promptness in handling between harvesting and freezing is necessary. Just as fruits are best when served fresh from the garden, so are they best when frozen in the shortest possible time after harvesting. If delays at any stage of preparation are unavoidable the product should be stored in a refrigerator or cold-storage room.

Careful sorting should be done in order to remove all moldy, soured, green, or overripe fruit, and twigs and leaves. Unless otherwise stated in the processing directions all fruit should be washed. When berries and other small fruits are washed they may be placed in a large strainer or small-mesh wire basket and dipped up and down in cold water until free from sand and dirt. Relatively shallow layers of fruit wash best. Careful handling is necessary in order to avoid bruising. Fruit should be well drained after washing in order to remove excess water.

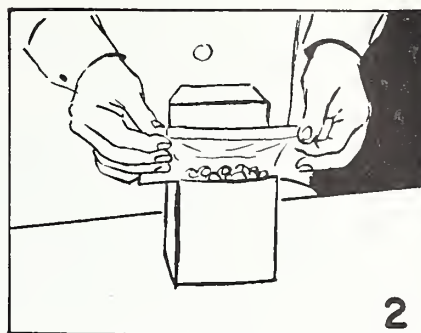
Fruits for freezing may be divided into two classes: (1) The small fruits, which can be prepared whole and which do not oxidize or darken easily, such as strawberries, raspberries, blueberries, dewberries, loganberries, youngberries, and boysenberries; and (2) the fruits which should be pitted or peeled and which oxidize quickly when the cut or pitted surfaces are exposed to the air, such as cherries, apricots, peaches, and apples. Fruits may be packed dry (without sugar), with sugar, or with sugar sirup. The method most suitable depends on the class of fruit to be preserved, the use to which it will be put, and the preference of the packer. Berries may be dry-packed. All berries and cherries may be sugar-packed. All fruits may be sugar-sirup packed. The dry pack is used for fruits to be made into pies or later processed into preserves, jelly, or juice.

In the sugar pack, the fruit may be packed whole,

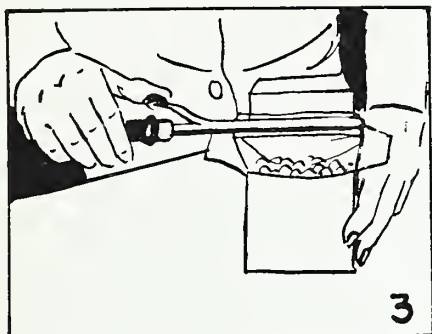
INSTRUCTIONS FOR FILLING AND SEALING CONTAINERS



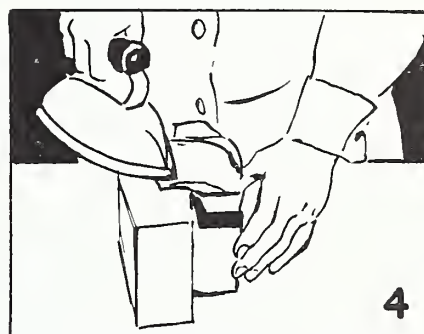
When filling cartons or bags use a specially designed funnel to prevent liquids or food particles from coming in contact with the sealing surfaces of the liner.



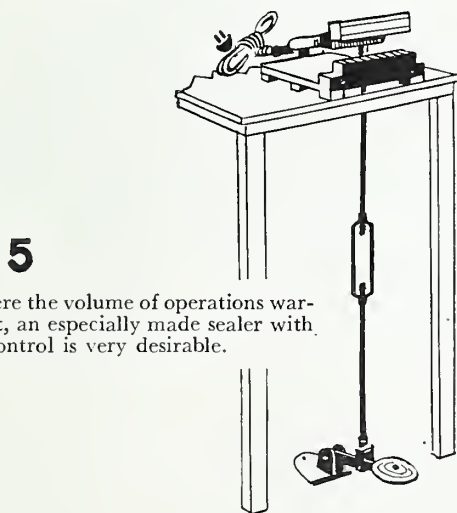
Do not fill the container quite full, leave some space for expansion. After filling, press the liner mouth together and fold over in one or two short folds. Just before sealing, press all excess air out of the container.



When using a curling iron to seal the container, press the sides together, first from one side of the fold and then the other.



When using an electric hand iron for sealing, use low heat and press the edges of the container for a moment as shown. Do not heat to the smoking stage.



Where the volume of operations warrants it, an especially made sealer with heat control is very desirable.



After the sealing operation is completed, fold the sealed edge down bringing the ends against the flaps as shown. Tuck in the flaps and the package is ready for freezing.

FIGURE 1.

sliced, chopped, or crushed. One pound of sugar to 3 or 4 pounds of fruit should be used, according to the taste of the consumer, and the acidity of the fruit. The sugar and fruit should be well mixed, so that the fruit is thoroughly coated by the dissolved sugar and juice when placed in the freezer. All the sugar should be dissolved before the freezing starts. Fruits packed with sugar may be used for all purposes.

The sugar-sirup pack is not as desirable as the dry and sugar packs for pies, preserves, and jellies because of the additional water that must be cooked out, but is more satisfactory for many dessert purposes than either the dry or sugar pack. The fruit may be packed whole, sliced, chopped, or crushed and then covered with 40- to 60-percent sirup according to taste, and acidity of the fruit. Sugar may be dissolved in either hot or cold water but the sirup must be cold when added to the fruit.

Corn sirup or honey may be substituted for part of the sugar used in freezing fruit. If more than 25 percent is substituted it gives a distinctive flavor to the fruit which some persons may not like.

The above statement would not apply to the newer types of mild-flavored enzyme converted crystal white corn sirups which are sometimes used alone without dilution. If the undiluted sirup is sweeter than desired it may be diluted in the proportion of 2 cups (1½ lb.) to ½ cup of water, or 6⅔ cups (5 lb.) to 1⅓ cups of water.

Ascorbic acid (vitamin C) may be used in the processing of apricots, peaches, and sweet cherries to retard browning not only during the preparation of these fruits for freezing but also during the thawing and use of the frozen fruit. It has not proved to be fully satisfactory for frozen apple slices because, under the usual conditions of use, its penetration into the apple slice is not sufficiently rapid or complete to prevent browning.

In preparing small quantities of fruit for freezing, use ½ teaspoonful of ascorbic acid per quart of cold sirup. Dissolve the acid in a *small* quantity of water and add it to the sirup just before the sirup is to be used. The addition of 1 teaspoonful of citric acid, or 4 teaspoonfuls of lemon juice, is considered desirable for sweet cherries, and is preferred by some people for use with apricots and peaches.

Several commercial preparations containing ascorbic acid are available to locker plants. These preparations are diluted with sugar or other ingredients for the purpose of making them easier to use. In using such preparations, the directions of the manufacturer should be followed.

TABLE 1.—Proportions of ingredients in the preparation of sirup

Percentage of sirup	Sugar to be added per quart of water	Sugar by weight to be added to 1 quart of water		Water to be added to 4 cups of crystal white corn sirup
	Cups	Pounds	Ounces	Cups
40.....	3¼	1	6	5
50.....	4¾	2	1	3
60.....	7	3	2	1½

It is seldom necessary or desirable to blanch (scald) fruits. In the few cases where it is advised the process is the same as for vegetables. See the general section on the preparation of vegetables for freezing.

PACKAGING OF FROZEN FRUITS

Fruits should be packed in containers that will prevent drying out which is known as freezer burn. This means that the package must be both moisture- and vapor-proof. Glass jars with tops and rubber rings are satisfactory if ¾ to 1½ inches of head space are allowed so that expansion of the freezing liquid will not crack the jar. Tin cans with friction tops give good protection and can be used more than once. Cans used for all kinds of berries, red cherries, plums, and other fruits of a similar color should be lined with R-enamel. They should not be filled more than nine-tenths full.

A wide variety of cartons, specially treated with wax, are available. They may be cylindrical, tub-shaped, or rectangular. Some prefer the cylindrical or tub-shaped specially waxed, and they are very satisfactory. Where locker space is at a premium more economical use of space is obtained with a rectangular container. Cartons with a moisture-vapor-proof liner have become quite widely used, and if care is taken to see that a tight seal is made to prevent leakage they are satisfactory. Wet-strength paper bags with a liner of moisture-vapor-proof cellophane are now being used. Allow a head space of ½ inch for short pints, 1 inch for tall pints, and 1½ inches for quart-sized containers. Close the liners or bags with an apothecary fold, pressing out excess air, then seal with curling iron or flat iron or special heat sealer. (See fig. 1, p. 3.) The temperature of the sealing iron should be 255° to 265° F. (temperature for ironing rayon) for best results. The newer types of plastic bags require a different temperature for sealing. The manufacturer's directions should be followed. Do not leave in contact with sealing iron until smoking starts. Some type of fireproof stand should be provided for hot irons in order to prevent the burning of table tops. The plastic bags may also be folded and tied tightly with cord.

Containers should be labeled with the date of processing, the contents, and the use for which the products are intended. One- and two-pound containers (pint and quart sizes) are most satisfactory for home use. Five- to ten-pound sizes are suitable for school lunch and institutional uses. Thirty-pound sizes may be used if they are not too thick for rapid freezing.

As soon as packaging is completed, place the packages in the freezer at 0° F., or lower, leaving a space around each package for air circulation. It is best not to stack packages in freezer. A fan to keep the air moving over the packages will shorten the time necessary for freezing. Freezing will take from 5 to 8 hours, depending on temperature of coils, size of package, and amount of air circulation. When frozen, store the packaged products in locker at 0° F.

PROCESSING INSTRUCTIONS FOR FRUITS

Apples

Quality of fresh fruit.—Choose apples that are not too soft or mealy. They should be fully matured but not overripe. A good firm or firm ripe condition is desired.

Preparation.—Wash thoroughly, pare, trim, core, and slice into eighths or twelfths. Apple rings may be prepared with the use of a small hand slicer. Since apple slices discolor rapidly in air they should receive some pretreatment before freezing. They may be held in a weak salt solution (made by adding 3 ounces of salt to 1 gallon of water) to protect against browning while handling. The slices are removed from the salt solution, scalded in boiling water or preferably steam if available, for 3 to 4 minutes depending on the size of slices, and then cooled quickly by dipping into cold water.

Packaging.—Apple slices may be frozen on trays and then packed or they may be packed directly in the container and then frozen. They may also be packed with 50-percent sugar sirup or with dry sugar in the proportion of 3 parts of fruit to 1 part of sugar by weight. Heavily waxed cartons, waxed cartons with a moisture-vapor-proof liner, locker bags, or glass jars may be used as containers. When apple slices are frozen on trays and then packed, no head space need be left. When filling other packs allow a head space of $\frac{1}{2}$ inch for short pints, 1 inch for tall pints, and $1\frac{1}{2}$ inches for quart-sized containers. Close all types of containers promptly. Heat-seal inner liners of cartons and locker bags.

Freezing.—Freeze at 0° F., or lower, and store at 0° F.

Apricots

Quality of fresh fruit.—Proper maturity is very important. Firm ripe fruit showing characteristic yellow color is best for freezing. Fruit should not have reached the soft or mushy stage. Prompt handling is essential since ripening proceeds rapidly at summer temperatures.

Preparation.—Sort, wash, halve, and pit. Peeling is not necessary for halved fruit. If desired, apricots may be dipped in boiling water for 15 to 30 seconds, cooled immediately in cold water, and the loosened skins may then be removed. Apricots may also be blanched in boiling water for 3 to 4 minutes, cooled in cold water, after which the skins may be removed, and then the fruit may be frozen on trays before packaging.

Packaging.—When fruit is to be frozen without blanching it must be packed promptly in order to prevent browning. Ascorbic acid may be used to retard browning. (See p. 4.) The preferred pack is with a cold 40- to 50-percent sugar sirup and with enough sirup to cover the fruit. Halves may also be mixed with 5, 4, or 3 parts fruit to 1 part of dry sugar. Waxed cartons with moisture-vapor-proof liners, locker bags, glass jars, and lacquered tin cans may be used as containers. When filling allow a head space of $\frac{1}{2}$ inch for short pints, 1 inch for tall pints, and $1\frac{1}{2}$ inches for

quart-sized containers. Close containers immediately after packing. Heat-seal inner liners of cartons and locker bags.

Freezing.—Freeze at 0° F., or lower, and store at 0° F.

Blackberries, Dewberries, Loganberries, Boysenberries

Quality of fresh fruit.—Proper maturity is important for all four types of berries. Immature berries must not be used. Berries as usually packed for fresh shipment are not sufficiently mature. Fully ripened berries are usually plump with a velvety skin. Since these berries ripen rapidly they should be handled promptly and with care to prevent bruising and spoilage.

Preparation.—Wash in cold water, sort, and drain thoroughly in order to eliminate excess water which would dilute the sirup used in packing.

Packaging.—Berries may be packed whole, crushed, or as a puree. For dessert purposes pack whole in a 40- to 50-percent sugar sirup, and use enough sirup to cover the berries. A 50- to 60-percent sirup may be used and is preferred for loganberries. Avoid crushing the whole berries when packing them into containers. For future use in making pie or jam, use 5 or 4 parts of berries to 1 part of sugar. For crushed or pureed berries, pack 3 parts of berries to 1 part of sugar, making sure sugar is well dissolved. Heavily waxed cartons, waxed cartons with moisture-vapor-proof liners, locker bags, glass jars, and lacquered tin cans may be used as containers. When packaging the sirup and sugar packs or puree allow a head space of $\frac{1}{2}$ inch for short pints, 1 inch for tall pints, and $1\frac{1}{2}$ inches for quart containers. Close tin cans and paper containers immediately after filling. Heat-seal inner liners of cartons and locker bags. In the case of glass jars put rubber rings and lids in place before freezing and tighten down when the product is frozen.

Freezing.—Freeze at 0° F. or lower, and store at 0° F.

Blueberries, Huckleberries

Quality of fresh fruit.—Select large, tender-skinned berries. Native wild types make an acceptable frozen product if only the best, small-seeded fruit are selected.

Preparation.—The fruit must be sorted in order to remove all immature berries, leaves, and twigs. Wash and drain before packing. Blanching in steam for 1 minute has been shown to improve the texture of the skin, and to give a very much improved product.

Packaging.—Blueberries may be packed dry, in 50-percent sugar sirup, or with sugar in a 5-to-1 ratio. The sirup pack is generally considered preferable. Heavily waxed cartons, waxed cartons with moisture-vapor-proof liners, locker bags, glass jars, and lacquered tin cans may be used as containers. When whole berries are frozen and then packed dry, do not leave any head space. When packaging the sirup and sugar packs or puree, allow a head space of $\frac{1}{2}$ inch for short pints, 1 inch for tall pints, and $1\frac{1}{2}$ inches for quart-sized containers. Close tin cans and paper containers immediately after packing. Heat-seal inner

liners of cartons and locker bags. In case of glass jars put rubber rings and lids in place before freezing and tighten down when product is frozen.

Freezing.—Freeze at 0° F., or lower, and store at 0° F.

Cherries, Sour

Quality of fresh fruit.—Use bright, uniformly red cherries of uniform maturity. Discard soft overripe, and discolored ones. Overripe cherries generally have too dark a color for best quality.

Preparation.—After sorting out the poor quality fruit wash the cherries in cold water, drain, and pit. A short soaking in cold water may make pitting easier. Long soaking should be avoided.

Packaging.—Sour cherries are best packed with dry sugar since a sirup pack is often too juicy for pie making. Pack in a ratio of 5, 4, or 3 parts fruit to 1 part of sugar. Pack crushed fruit or juice with sugar in a ratio of 3 or 2 to 1. The sugared cherries are placed in the container and then covered with juice which has been drawn out of the fruit by the action of the sugar. Waxed cartons with moisture-vapor-proof liners, locker bags, glass jars, and lacquered tin cans may be used as containers. When filling allow a head space of ½ inch for short pints, 1 inch for tall pints, and 1½ inches for quart-sized containers. Close tin cans and paper containers immediately after packing. Heat-seal inner liners of cartons and locker bags. In the case of glass jars put rubber rings and lids in place before freezing and tighten down when products are frozen.

Freezing.—Freeze at 0° F., or lower, and store at 0° F.

Cherries, Sweet

Quality of fresh fruit.—Proper maturity is essential to a good product. Fully tree-ripened fruit picked when firm has the best flavor and softens least during freezing. Careful handling of fruit after picking is essential in order to prevent bruising which will cause brown spots in the frozen product.

Preparation.—Stem, sort, and wash in cold water. Cherries may be frozen whole or pitted. However, pits give an almond-like flavor which some people do not care for. Sweet cherries also may be pitted and then crushed for sauce.

Packaging.—Pack whole fruit in a 40- to 50-percent sugar sirup. Ascorbic acid may be used to retard browning. (See p. 4.) Dry-sugar packs or packs without sugar or sirup are not recommended. Waxed cartons with moisture-vapor-proof liners, locker bags, glass jars, or lacquered tin cans may be used as containers. When packing in containers allow a head space of ½ inch for short pints, 1 inch for tall pints, and 1½ inches for quarts. Close tin cans and paper containers immediately after packing. Heat-seal inner liners of cartons and locker bags. If glass jars are used, put rubber rings and lids in place before freezing and tighten down when product is frozen.

Freezing.—Freeze at 0° F., or lower, and store at 0° F.

Cranberries

Quality of fresh fruit.—Use mature, good quality fruit; an even deep-red color is desirable.

Preparation.—Wash, stem, and eliminate poor berries. Avoid bruising.

Packaging.—Cranberries are packed whole, either dry or in a 50-percent sugar sirup. They also can be pureed and packed in an equal amount of sugar. Heavily waxed cartons, waxed cartons with moisture-vapor-proof liners, locker bags, glass jars, and lacquered tin cans may be used as containers. When whole berries are frozen and then packaged before storing leave about ½-inch head space. When packaging the sirup-pack or puree, allow a head space of ½ inch for short pints, 1 inch for tall pints, and 1½ inches for quart-sized containers. Close tin cans and paper containers immediately after packing. Heat-seal inner liners of cartons and locker bags. If glass jars are used, put rubber rings and lids in place before freezing and tighten down when product is frozen.

Freezing.—Freeze at 0° F., or lower, and store at 0° F.

Currants and Gooseberries

Quality of fresh fruit.—Pick at firm ripe stage such as is customary for immediate use.

Preparation.—Wash, remove stems, and crush with sugar in the proportion of 3 pounds of berries to 1 pound of sugar.

Packaging.—Pack in heavily waxed cartons, waxed cartons with inner liners, locker bags, glass jars, or lacquered tin cans. Allow a head space of ½ inch for short pints, 1 inch for tall pints, and 1½ inches for quart-sized containers. Heat-seal inner liners of cartons and locker bags. Place rubber rings and caps on glass jars, freeze, and then tighten the lids.

Freezing.—Freeze at 0° F., or lower, and store at 0° F.

Figs

Quality of fresh fruit.—Figs used for freezing should be at the full ripe stage suitable for eating fresh.

Preparation.—Wash in cool water and sort out any which are overripe or sour. Cut off stems. The figs may be left whole or peeled and sliced.

Packaging.—Pack in 40- or 50-percent sirup. Figs also may be frozen whole without sirup, if it is desired to use them for sauce. They also may be frozen with sugar in a proportion of 4 parts of figs to 1 part of sugar.

Heavily waxed cartons, waxed cartons with moisture-vapor-proof inner liners, locker bags, or glass jars may be used as containers. When filling allow a head space of ½ inch for short pints, 1 inch for tall pints, and 1½ inches for quart-sized containers. Heat-seal inner liners of cartons and locker bags. Place rubber rings and caps on glass jars, freeze, and then tighten.

Freezing.—Freeze at 0° F., or lower, and store at 0° F.

Peaches

Quality of fresh fruit.—Most satisfactory maturity is at the firm, ripe stage, which is usually a few days later than the stage at which peaches are shipped fresh.

The fruit should not have reached the soft ripe stage because the texture of such peaches when thawed is not fully satisfactory. Green, hard fruit gives a bitter product. Yellow-fleshed freestone varieties are preferred but white peaches may be used. Frozen clingstone peaches are not considered very satisfactory for serving as a fresh dessert, but are very good for pies.

Preparation.—Promptness in handling is essential in order to prevent browning. Ascorbic acid may be used to retard browning. (See p. 4.) Peaches for freezing are scalded in boiling water or steam for 15 to 30 seconds and cooled quickly in cold water in order to loosen the skins. Freestone peaches are usually pitted and sliced or less often cut into halves. The prepared fruit may be placed in cold water or a 1-percent citric acid solution (made by adding $1\frac{1}{3}$ ounces of the acid to 1 gallon of water) for holding until ready for packaging. Three tablespoonfuls of lemon juice to a gallon of water may replace the citric acid solution. When crushed fruit or puree is prepared, mix with sugar in a ratio of 3 to 1. Peaches to be used for pies may be blanched in boiling water or steam for 3 to 4 minutes.

Packaging.—Cover the peaches with a cold 40- to 50-percent sugar sirup as soon as they are placed in the container. Some use a 60-percent sugar sirup. Airtight containers are necessary. Waxed cartons with moisture-vapor-proof liners, locker bags, glass jars, and lacquered tin cans may be used as containers. In round containers, a piece of crumpled wax paper or cellophane may be placed under the lid to press down the pieces of fruit which have a tendency to float. By holding them down in the sirup until frozen, browning of these pieces may be reduced. When filling allow a head space of $\frac{1}{2}$ inch for short pints, 1 inch for tall pints, and $1\frac{1}{2}$ inches for quart-sized containers. Close all types of containers immediately after packing. Heat-seal inner liners of cartons and locker bags.

Freezing.—Freeze at 0° F., or lower, and store at 0° F.

Plums and Prunes

Quality of fresh fruit.—Proper maturity is essential to the quality of the frozen product. Use fruit that is freshly picked and tree-ripened, but not so ripe that browning of the flesh about the seeds has occurred.

Preparation.—Sort, wash in cold water, halve, and pit.

Packaging.—Cover promptly with sirup. Usually a 50-percent sirup is preferred for prunes. Plums require a 50- to 60-percent sirup. They also may be puréed and packed with sugar in a ratio of 4 or 3 parts of fruit to 1 part of sugar. Heavily waxed cartons, waxed cartons with moisture-vapor-proof liners, locker bags, glass jars, and lacquered tin cans may be used as containers. When packing into containers allow a head space of $\frac{1}{2}$ inch for short pints, 1 inch for tall pints, and $1\frac{1}{2}$ inches for quart-sized containers. Close tin cans and paper containers immediately after packing. Heat-seal inner liners of cartons and locker bags. If glass jars are used, put rubber rings and lids in place before freezing and tighten down when product is frozen.

Freezing.—Freeze at 0° F., or lower, and store at 0° F.

Raspberries, Black

Quality of fresh fruit.—The fruit should be harvested at the full-ripe stage before the berries begin to dry. They should have rich color, plumpness, juicy flesh, large size, and minimum seediness. Although black raspberries can be held a few days in cool storage it is better to process them as soon as possible after picking.

Preparation.—Remove any poorly formed, immature, or small berries as well as stems and leaves. Wash in cold water and drain thoroughly since the cavity at the stem end often retains a considerable amount of water after washing. If the berries are not dusty and have been carefully handled, washing may be omitted.

Packaging.—These berries may be packed in a proportion of 3 or 4 of fruit to 1 of sugar by weight. Mix well before packing into containers. A better method is to pack berries into containers and to cover them with a cold 40- to 60-percent sugar sirup. Glass jars, lacquered tin cans, plain or lined waxed paperboard containers, or locker bags may be used for packaging. Plain tin cans cause discoloration of the fruit. Sugar-packed berries in cartons need about $\frac{1}{2}$ -inch head space. Sirup-packed berries in cartons and cans need about 1-inch head space and in quart glass jars, $1\frac{1}{2}$ inches. Heat-seal inner liner of cartons and locker bags.

Freezing.—Freeze at 0° F., or lower, and store at 0° F.

Raspberries, Red, Purple, or Yellow

Quality of fresh fruit.—Firm, ripe raspberries of about the maturity stage selected for shipment, seem to give the best frozen pack. Overripe berries have an unattractive dark color after freezing storage. Berries with a smooth compact structure, deep red color, and rich flavor are the most desirable. There should be no more delay than is necessary between picking and packing. If delays are unavoidable the berries should be held in cool storage.

Preparation.—Sort carefully, wash in cold water, and drain thoroughly to prevent dilution of the sirup. If the berries are clean and not dusty the washing may be omitted. Extra care is needed in handling in order to prevent bruising.

Packaging.—A 40- to 50-percent sugar-sirup is preferred. Raspberries also may be packed in sugar. One part of sugar to four parts of berries by weight is considered satisfactory. A ratio of 1 of sugar to 3 or 5 of berries may also be used. If desired, berries may also be puréed with sugar in a proportion of 3 to 1 by weight. When berries are to be packed dry they may be frozen loose and then packed into containers. In this case no extra head space need be allowed for expansion after packaging. Heavily waxed cartons, waxed cartons with moisture-vapor-proof liners, locker bags, glass jars, and lacquered tin cans may be used as containers. In the case of sirup pack, allow a head space of $\frac{1}{2}$ inch for short pints, 1 inch for tall pints, and $1\frac{1}{2}$ inches for quart-sized containers. Close tin cans and paper containers immediately after packing. Heat-seal inner liners of cartons and locker bags. If glass jars are used, put rubber rings and lids in place

before freezing and tighten down when product is frozen.

Freezing.—Freeze at 0° F., or lower, and store at 0° F.

Strawberries

Quality of fresh fruit.—Strawberries chosen for freezing should be uniformly ripe and at the stage suitable for eating as fresh berries, firm but not mushy. Since strawberries deteriorate rapidly after harvesting they should be processed and frozen as soon as possible after being picked. If it is necessary to hold them for a short time they should be kept in a refrigerator.

Preparation.—Remove any immature or overripe berries. Wash in cold water. A wire basket may be used and dipped up and down in the water to remove sand or dirt. Drain the berries and remove the hulls.

Strawberries may be sliced, left whole, or crushed for freezing. The flavor of frozen, sliced berries is considered better than that of frozen whole berries. Sirup pack is usually considered better for dessert purposes than dry-sugar pack.

Packaging.—1. **SLICED OR CRUSHED BERRIES:** Mix with sugar in the proportion of 4 parts of berries to 1 part of sugar.

2. **WHOLE BERRIES:** (a) Sugar pack by mixing 4 or 5 parts of berries with 1 part of dry sugar by weight.

(b) Sirup pack by covering whole berries with a cold 50- or 60-percent sugar sirup according to taste of consumer.

Package in cartons or locker bags which may be heat-sealed, allow about ½ inch head space for expansion on freezing, except in sirup pack where about 1 inch is needed. Glass jars may also be used if a head space of 1½ inches is left in quart-sized jars. It is also possible to use tin cans if they are lined with R-enamel. They should be filled only nine-tenths full.

Freezing.—Seal packaged fruit and freeze promptly at 0° F., or lower. Store at 0° F.

THAWING AND USING FROZEN FRUITS

On the shelf of a refrigerator a 1-pound package will thaw in about 6 to 7 hours. At room temperature about 3 hours will be needed unless an electric fan is used to blow air on the package. This will reduce the time needed for thawing to about 1 hour. Watertight packages may be thawed in cold running water in about 40 minutes.

All fruits which are thawed before they are used should be allowed to thaw in their containers. Do not remove fruit from containers until ready to use it, since color and flavor changes take place more rapidly on exposure to air. Only the amount that can be eaten at one meal should be thawed at one time. Dry-frozen fruits should be eaten when barely thawed or thawed in a suitable sirup. Sirup-packed fruits are considered best when served just before they are completely thawed and still contain some ice crystals. If the sirup-packed fruit is used in making pies, remove part of the sirup as ice crystals when the fruits are partially thawed. These sirup-covered crystals may be used in iced drinks. The sugar-packed fruits may

be partially thawed and eaten, but are often used for pies or preserves since there is less water to cook out than in those that are sirup-packed. In the preparation of preserves the fruit need not be thawed before putting it into the kettle. For pie and cobblers thaw only enough to spread. Partially thaw for shortcake, puddings, and ice cream. In using frozen fruits allowance should be made for the sugar that was added before the fruit was frozen.

PREPARATION OF VEGETABLES FOR FREEZING

All vegetables for freezing should be carefully selected and prepared. Only those of the optimum stage of maturity should be frozen. This stage is the one most desirable for use as a fresh vegetable.

If possible, vegetables intended for freezing should be harvested in the cool part of the morning. They should not be held any longer than necessary before preparation or freezing. Vegetables deteriorate rapidly at room temperature, and if it is impossible to process them promptly they should be packed in crushed ice or placed in a chill room at a temperature of from 32° to 40° F., for not more than a few hours. The shorter the time interval from harvesting to freezing, the better the quality of the product will be. Vegetables must not be prepared the night before and held until the next day before freezing.

Wash all vegetables thoroughly in order to remove sand, dirt, and other foreign material. Use a large volume of clean cool water and change it frequently. It is often necessary to use a brush to remove dirt from root crops. Greens need to be floated and agitated so that the leaves will not stick together. In addition to the dirt and grit, washing also removes spray residues and lowers the number of spoilage bacteria in the finished product. During the washing process is a good time to check for and remove any bruised, spoiled, or otherwise defective vegetables which may have been overlooked.

TABLE 2.—Blanching time for specified products

Product	Blanching time	
	In water	In steam ¹
FRUITS		
Apples.....	Minutes 3-4	Minutes 3-4
Apricots.....	3-4	3-4
Blueberries.....		1
Peaches, clingstone.....	3-4	3-4
VEGETABLES		
Asparagus:		
Small.....	2	2
Medium.....	3	3
Large.....	4	4
Beans, green and wax.....	2	2
Beans, lima:		
Small.....	1½	1½
Large.....	2	2
Extra large.....	3	3
Beets:		
Diced.....	2-3	2-3
Small, whole.....	3-4	3-4
Broccoli.....	3-3½	3-3½

See footnote at end of table.

TABLE 2.—Blanching time for specified products—Continued

Product	Blanching time	
	In water	In steam ¹
VEGETABLES—Continued		
Brussels sprouts:	<i>Minutes</i>	<i>Minutes</i>
Small.....	3	3
Medium.....	4	4
Large.....	5	5
Carrots:		
Diced.....	3	3
Small, whole.....	5	5
Corn, cut.....	3	
Corn-on-cob:		
Small.....	7	7
Medium.....	9	9
Large.....	11	11
Eggplant.....	4	5
Peas.....	1½	1½
Peppers.....	2	
Rhubarb.....	1½	
Squash.....	3-4	
Spinach.....	1½	1½
Turnips and rutabagas.....	2-3	2-3

¹ The time shown in this column is based on the use of an efficient steam blancher. The figures should be increased ½ to ½ when a vegetable steamer or a large kettle is used.

It is necessary to blanch (scald) vegetables before freezing.¹ The purpose of blanching is to inactivate the enzymes that cause flavor changes and destruction of certain vitamins. Blanching also helps to retain a good color in the frozen product. In order not to impart a cooked character to the product the recommended times given for the various vegetables should be closely followed. Blanching must be done in large quantities of boiling water to permit the water to return rapidly to the boiling point after the vegetable is added. Blanching time is counted from the time the water returns to the boiling point. Not more than 1 minute should be required for the water to boil again. Check temperature of the water in the blanching vat with a thermometer to make sure it has reached the boiling point (212° F., at sea level).

Since the temperature of boiling water varies with elevation, the blanching time should be increased slightly at higher altitudes.

Elevation in feet:	Time added in seconds
1,000 to 3,000.....	15
3,000 to 5,000.....	30
5,000 to 7,000.....	45
7,000 to 9,000.....	60

At least 1 gallon of water is needed for each pound of vegetable; for leafy vegetables 2 gallons per pound is desirable. Long-handled wire baskets, colanders, or cheesecloth may be used to hold the vegetables. Lift the basket or other container up and down to agitate the product so that it is evenly heated. As soon as the time is up, cool in cold running water or water to which ice has been added. A water temperature of

60° F., or lower, is necessary. Cooling time is about the same as blanching time. Do not allow the vegetable to stand in the water longer than necessary for cooling. Allow to drain before packing.



FIGURE 2.—This equipment may be used for blanching fruits and vegetables in a community locker plant.

Another method of blanching is by the use of steam. This may be done in a pressure canner, retort, vegetable steamer, or a large kettle with tight fitting lid. (See fig. 2.) The vegetable is placed in a wire basket on a rack above rapidly boiling water, and covered with the lid as quickly as possible. With a retort or a pressure canner the pet cock should be left open. Begin timing when there is a good flow of steam from the pet cock or if a kettle is used, when the steam rises again. (See table 2, footnote 1.) The same prompt cooling by dipping in cold running or ice water is necessary as for water blanching. Steam blanching is not desirable for leafy green vegetables since they tend to mat together.

Steam blanching is tricky and somewhat less reliable than water blanching. Care must be taken to see that layers of the vegetables are thin enough so that steam will reach all parts at the same time or nearly so.

PACKAGING AND FREEZING VEGETABLES

All vegetables must be packed in containers which will prevent their drying out which is known as freezer burn. Heavily waxed cartons with tight covers may be used. These may be cylindrical, tub-shaped, or rectangular. The rectangular lightly waxed cartons with an inner liner of moisture-vapor-proof cellophane have become widely used and are more economical of

¹ Blanching time is given in the directions for the preparation of each product but for convenient reference a table showing time required for each fruit and vegetable will be found on page 8. This table may be copied and posted on the wall of the processing room of the locker plant.

locker space than round containers. Bags of wet-strength paper, lined or laminated with moisture-vapor-proof cellophane, are also being used. Plain tin cans with friction tops and glass jars with rubbers may be used. The only disadvantage with the glass jar is that if filled too full it may break. Both tin cans and glass jars are economical in that they may be reused.

After blanching, cooling, and draining, the vegetables are packed dry or in brine. The brine used for this purpose is made by adding 2 to 4 level teaspoonsful of salt to 1 quart of water, according to the taste desired. These proportions give a range of from 1 to 2 percent brine. Although most commercial packs are dry some individuals may prefer the brine pack since it gives some added protection against drying and helps to retain a better color in the product. The brine also adds some protection to the frozen product after it is removed from storage. This fact should not be abused by holding the product too long in a thawed state. Although the brine pack adds some protection to the frozen product it should be borne in mind that this advantage is offset somewhat by the fact that in pouring off all or part of the brine before cooking, there is some loss of minerals and vitamins.

No general rule can be given on how full to pack a container. A loosely filled dry pack should need little, if any, head space. For a tightly filled dry pack one-half inch is usually sufficient for most types of containers. For the brine pack allow a head space of one-half inch for short pints, 1 inch for tall pints, and 1½ inches for quart-sized containers. No head space need be allowed in packing vegetables which are frozen on trays before packaging. Tin cans may be filled about nine-tenths full.

When filling cartons and bags which are to be heat-sealed use a funnel so that no food will touch the edges and spoil the seal.

Close the liners of the cartons and bags with an apothecary's fold, the same fold which is often used by the confectioner in wrapping boxes of candy. Be careful to press the bag or liner together so as to remove excess air. (See fig. 1, p. 3.) Heat-seal by using a flatiron, curling iron, or a heat-sealer made especially for this purpose. The temperature of the sealing iron should be 255° to 265° F. (temperature for ironing rayon) for the best results. The newer types of plastic bags require a different temperature for sealing. The manufacturer's directions should be followed. A fire-proof stand should be provided for hot irons in order to prevent the burning of table tops. Some types of waxed cartons may be heat-sealed, others have friction tops which are slipped on. Put rubber rings and tops on glass jars loosely, place in freezer then tighten down after freezing. For tin cans simply put the friction tops on tightly. The plastic bags may also be folded and tied tightly with cord.

Containers should be labeled with the date of processing, the patron's name and locker number, the contents, and the type of pack.

As soon as the products are packed, spread the packages on the coils in the freezer, which should be at 0° F., or lower. A space should be left between the packages to allow for air circulation. Stacking of the

packages should be avoided. Products frozen loose on trays should be spread in thin layers.

The use of a fan to increase the circulation of the air over the coils and among the packages will increase the rate of freezing.

The time needed is dependent on the temperature of the coils, the size of the package, and the rapidity of air circulation. Depending on these variables, it will take from 5 to 8 hours for the packages to reach the temperature of the freezer.

PROCESSING INSTRUCTIONS FOR VEGETABLES

Asparagus

Quality of fresh vegetable.—Freshly harvested asparagus stalks which are succulent and not woody are chosen. Tender tips are the most desirable. Often the upper 5 or 6 inches of the stalk is all that is satisfactory. Asparagus deteriorates rapidly, in both texture and flavor, after harvest. There is also a loss in sugar content after cutting. Keeping the asparagus cool and moist from the time of harvest until it can be processed is necessary for a good frozen product.

Preparation.—Carefully sort and wash in cold water. Do not use iron utensils as iron will cause discoloration of the asparagus. It is desirable to sort into groups according to diameters since a different blanching time is necessary for large and small sizes. Trim all stalks to the same length in order to fit the package, discard the lower white woody portion. Blanch, in boiling water or steam—small stalks 2 minutes, large stalks 4 minutes. Cool immediately in cold running water. As soon as cooling is completed, remove the asparagus from water so that desirable water-soluble constituents may not be leached out.

Packaging.—Pack the stalks parallel in the container, with the heads in alternate directions. They may be packed dry or in brine. Brine pack may give a better textured product. All types of containers are suitable if of the proper shape. Dry-packed asparagus will need only about ½-inch head space. For brine pack, cover with the brine and allow a head space of ½ inch for flat cartons, 1 inch for tall cartons, and 1½ inches for quart-sized glass jars. Fill cans (only the lacquered cans should be used), nine-tenths full. Heat-seal the inner liners of cartons and locker bags. Leave glass jar caps loose until product is frozen and then tighten down on rubbers.

Freezing.—Freeze promptly at 0° F., or lower, and store at 0° F.

Beans, Green and Wax

Quality of fresh vegetable.—Select freshly harvested, medium-sized, crisp, succulent beans somewhat on the immature side. Overmature beans are too fibrous to be suitable for freezing, as they become too tough. A good green, or in the case of wax beans a bright yellow, color is desirable.

Preparation.—Wash thoroughly in cold water, snip and string if necessary. Cut or break into 2-inch lengths. Avoid the use of iron utensils which will

cause discoloration. Blanch in boiling water or steam for 2 minutes. Cool in cold running water, remove promptly, and drain.

Packaging.—Pack dry or in brine. Better texture is usually obtained with brine. Any moisture-vapor-proof container is satisfactory. About ½-inch head space is satisfactory for the dry pack in most containers. For the brine pack allow a head space of ½ inch for short pints, 1 inch for tall pints, and 1½ inches for quart-sized containers. Fill tin cans nine-tenths full. Heat-seal inner liners of cartons and locker bags. Leave jar caps loose until product is frozen, then tighten down on rubbers.

Freezing.—Freeze promptly at 0° F., or lower, and store at 0° F.

Beans, Lima

Quality of fresh vegetable.—Green lima beans are considered best for freezing. They should be small or of medium size and not mealy.

Preparation.—Do not delay processing after harvesting any longer than necessary. After shelling, lima beans should be processed promptly. Sort beans, discarding imperfect and overmature ones, separating white beans for separate packing. Wash in cold running water, blanch in boiling water or steam—small beans 1½ minutes, large beans 2 minutes, extra large beans 3 minutes. Cool promptly in cold running water and drain.

Packaging.—Lima beans may be packed dry or in brine. Any moisture-vapor-proof container is satisfactory. About ½-inch head space is sufficient for the dry pack in most containers. For the brine pack, allow a head space of ½ inch for short pints, 1 inch for tall pints, and 1½ inches for quart-sized containers. Fill tin cans nine-tenths full. Heat-seal inner liners of cartons and locker bags. Leave jar caps loose until product is frozen and then tighten down on rubbers.

Freezing.—Freeze promptly at 0° F., or lower, and store at 0° F.

Beets

Quality of fresh vegetable.—Beets for freezing should be young and tender.

Preparation.—Cut off tops. If young and tender the tops may be frozen for greens. Wash the beets thoroughly in cold running water, scrubbing them with a brush to remove dirt and grit. Scald in boiling water ½ minute and cool in water quickly for easy peeling. Small, young, tender beets may be frozen whole. Larger beets should be sliced or diced. Blanch in boiling water, slices or cubes, from 2 to 3 minutes, and whole small beets from 3 to 4 minutes. Cool promptly in cold running water and drain. It may be found more satisfactory to cook unpeeled beets whole, and then peel, and slice or dice, and freeze.

Packaging.—Pack without brine. All types of moisture-vapor-proof containers are suitable. However, if tin cans are used they should be lacquered. About ½-inch head space should be allowed in containers. Heat-seal inner liners of cartons and locker bags.

Place caps on glass jars, freeze, and then tighten down on rubbers.

Freezing.—Freeze promptly at 0° F., or lower, and store at 0° F.

Broccoli

Quality of fresh vegetable.—Select tender, dark green, compact heads with sound stalks.

Preparation.—Trim off large leaves and woody stems. Wash carefully, inspecting heads for insects and worms. Separate the heads into pieces not thicker than 1 inch. Large stems may be split lengthwise. Blanch in boiling water or steam from 3 to 3½ minutes according to size. Cool the broccoli promptly in cold water and drain.

Packaging.—Broccoli may be packed dry or in brine. Any type of moisture-vapor-proof container is suitable. Allow about ½-inch head space for dry pack. For the brine pack, allow a head space of ½ inch for short pints, 1 inch for tall pints, and 1½ inches for quart-sized containers. Fill tin cans nine-tenths full. Heat-seal inner liners of cartons and locker bags. Leave jar caps loose until product is frozen, then tighten down on the rubbers.

Freezing.—Freeze promptly at 0° F., or lower, and store at 0° F.

Brussels Sprouts

Quality of fresh vegetable.—Sprouts should be dark green in color with compact and firm heads. They should not be allowed to wilt.

Preparation.—Cut the sprouts from the main stem and remove all loose outer leaves. Wash thoroughly in cold water and divide into three size-groups. Blanch in boiling water or steam—small 3 minutes, medium 4 minutes, and large 5 minutes. Cool in water promptly and drain.

Packaging.—Pack dry or in brine. Any moisture-vapor-proof container is satisfactory. For dry pack ½-inch head space is sufficient for most sizes of containers. For the brine pack, allow a head space of ½ inch for short pints, 1 inch for tall pints, and 1½ inches for quart-sized containers. Fill tin cans nine-tenths full. Heat-seal inner liners of cartons and locker bags. Leave glass jar caps loose until product is frozen and then tighten down on rubbers.

Freezing.—Freeze promptly at 0° F., or lower, and store at 0° F.

Carrots

Quality of fresh vegetable.—Carrots for freezing should be tender. Overmature, woody, and inferior specimens should not be used.

Preparation.—Cut off tops. Scrub the carrots with a stiff brush under cold running water. Very small tender carrots may be frozen whole, but others should be diced into ¼-inch cubes. They also may be frozen in thin slices. Blanch the diced or sliced carrots in boiling water or steam for 3 minutes. Small whole carrots may require blanching for as long as 5 minutes. Cool in cold water.

Packaging.—Pack dry or in brine. Any type of moisture-vapor-proof container is satisfactory. A dry

pack needs only about 1/2-inch head space for most sizes of containers. For the brine pack, allow a head space of 1/2 inch for short pints, 1 inch for tall pints, and 1 1/2 inches for quart-sized containers. Fill tin cans nine-tenths full. Heat-seal inner liners of cartons and locker bags. Leave jar caps loose until the product is frozen, and then tighten down on the rubbers.

Freezing.—Freeze promptly at 0° F., or lower, and store at 0° F.

Cauliflower

Quality of fresh vegetable.—Select compact, tender heads of white cauliflower. Heads that show a brownish or pink discoloration should not be used.

Preparation.—Remove the outer green leaves and break the head into pieces not over 1 inch thick. Wash the pieces in cold running water and sort. Blanch in boiling water 2 1/2 to 3 1/2 minutes, depending on sizes of pieces. Cool quickly in cold water and drain.

Packaging.—Pack dry or in brine. Any moisture-vapor-proof container is satisfactory. About 1/2-inch head space is sufficient for the dry pack in most containers. For the brine pack, allow 1/2 inch for short pints, 1 inch for tall pints, and 1 1/2 inches for quart-sized containers. Fill cans nine-tenths full. Heat-seal inner liners of cartons and locker bags. Leave glass jar caps loose until product is frozen and then tighten down on rubbers.

Freezing.—Freeze promptly at 0° F., or lower, and store at 0° F. A general brownish coloration which may appear in freezing will disappear on thawing.

Corn, Sweet

Quality of fresh vegetable.—Select corn that is of the optimum maturity for table use, that is, when the kernels are well formed and juicy, but before the starchy stage has been reached. The best stage is that at which the "milk" spurts out when the kernel is ruptured by the thumb nail. Less mature corn generally has good flavor but little "body." Harvesting in the morning is preferable.

Preparation.—It is necessary to handle the corn as rapidly as possible from the time of harvesting until it is processed. The usual shucking, silking, and trimming of the ends are necessary, whether corn is to be packed in the cut-off form or on the cob. Wash in cold running water. For corn on the cob, cutting into 3-inch lengths makes handling easier.

1. **CUT CORN:** Blanch, on the cob, in boiling water for 3 minutes, cool in cold water, and drain. Cut the corn off the cob with a sharp knife and rinse the kernels quickly in cold water, skimming off any chaff from the surface. Drain off excess water.

2. **CORN ON THE COB:** Separate into three diameter sizes. Blanch in boiling water or steam—small diameter 7 minutes, medium 9 minutes, large 11 minutes. Cool in cold water as quickly as possible and drain.

Packaging.—Pack cut corn in any moisture-vapor-proof container. About 1/2-inch head space will be needed for most sizes of containers. Heat-seal inner liners of cartons and locker bags. Leave glass jar caps loose until product is frozen and then tighten down on

rubbers. Corn on the cob is best packed, one ear alone, or several ears, in vapor-proof paper, the ends of which are twisted or heat-sealed. These packets may be stored in suitable cartons or bags.

Freezing.—Freeze corn on the cob on trays or in a container holding 3 to 6 ears. Freeze both cut-off corn and corn on the cob promptly at 0° F., or lower, and store at 0° F.

Eggplant

Quality of fresh vegetable.—Choose fruit that is mature but not overripe.

Preparation.—Wash in cold water, pare, and slice into 1/3- to 1/2-inch slices. Blanch 4 minutes in boiling water or 5 minutes in steam. Cool promptly in cold running water and drain.

Packaging.—Pack without brine. Any moisture-vapor-proof container is satisfactory. About 1/2-inch head space is sufficient for most sizes of containers unless pack is very tight, then a little more space may need to be allowed in the larger containers. Heat-seal the inner liners of cartons and locker bags. Leave glass jar caps loose until product is frozen and then tighten down on rubbers.

Freezing.—Freeze promptly at 0° F., or lower, and store at 0° F.

Peas

Quality of fresh vegetable.—The garden varieties of peas that have a high sugar content are preferred for freezing. Of the garden varieties the green-skinned, wrinkled-seeded ones are best. Select the peas at the optimum stage for consumption as a fresh vegetable. Alaska peas are not considered suitable for freezing.

Preparation.—Freshly harvested peas deteriorate very rapidly. They may lose 20 percent of their natural sugar in 24 hours. If holding is unavoidable they should be kept cold. Shelled peas deteriorate faster than unshelled ones. Therefore, peas should be processed immediately after shelling. Wash thoroughly in cold running water. This not only cleans but also cools the peas. Sort out mature starchy peas, splits, skins, and trash. Blanch in boiling water or steam for 1 1/2 minutes. Cool promptly in cold running water and drain.

Packaging.—Pack dry or in brine. Any moisture-vapor-proof container may be used. About 1/2-inch head space is satisfactory for dry pack. With brine pack, allow a head space of 1/2 inch for short pints, 1 inch for tall pints, and 1 1/2 inches for quart-sized containers. Fill tin cans nine-tenths full. Heat-seal inner liners of cartons and locker bags. Place caps on glass jars, freeze, and then tighten down on rubbers.

Freezing.—Freeze promptly at 0° F., or lower, and store at 0° F.

Pumpkin and Squash

Quality of fresh vegetable.—Summer squash should be frozen before the rind hardens. Well-ripened, fully mature winter squash and pumpkin should be used for best results. High solids or dry-type pumpkins and squash are best for freezing.

Preparation.—Pare pumpkin and winter squash and cut into 1-inch cubes. Steam until soft (about 30 minutes), mash or put through sieve and cool. Summer varieties need not be pared, but should be cut into ½-inch slices. Blanch slices in boiling water for 3 to 4 minutes, cool in cold water, and drain.

Packaging.—Pack without brine in heavily waxed cartons, cartons with 'moisture-vapor-proof' liners, locker bags, glass jars, or lacquered tin cans. Allow a head space of ½ inch for short pints, 1 inch for tall pints, and 1½ inches for quart-sized containers. Fill cans nine-tenths full. Heat-seal inner liners of cartons and locker bags. Leave jar caps loose until product is frozen and then tighten down on the rubbers.

Freezing.—Freeze promptly at 0° F., or lower, and store at 0° F.

Peppers, Green and Pimiento

Quality of fresh vegetable.—Select the same quality as for fresh use.

Preparation.—Wash thoroughly in cold water, halve and slice; remove seeds. Blanching is not necessary but makes packing easier. Dipping in boiling water for 2 minutes is sufficient for blanching. Cool promptly and drain.

Packaging.—Pack dry or in brine. Any moisture-vapor-proof container is satisfactory. For dry pack, ½-inch head space is sufficient for most sizes of containers. For brine pack, allow a head space of ½ inch for short pints, 1 inch for tall pints, and 1½ inches for quart-sized containers. Fill tin cans nine-tenths full. Heat-seal inner liners of cartons and locker bags. Leave glass jar caps loose until product is frozen and then tighten down on rubbers.

Freezing.—Freeze promptly at 0° F., or lower, and store at 0° F.

Rhubarb

Quality of fresh vegetable.—Early spring rhubarb is considered best for freezing. The stalk should be succulent, tender, and free from fibrous texture.

Preparation.—Cut off the leaves, wash the stalks and cut into 1-inch lengths. Blanching is not considered essential but is sometimes done when the rhubarb is to be dry-packed. In this case, blanch in boiling water for 1½ minutes and cool in cold water. Remove as soon as cold and drain.

Packaging.—Pack dry or with 40- to 50-percent sirup (¾ to 4¾ cups of sugar per quart of water). Dry-frozen rhubarb may be packed in any container which will prevent moisture loss. For rhubarb packed with sirup, heavily waxed cartons, cartons with moisture-vapor-proof inner liners, locker bags, tin cans, and glass jars are satisfactory. For dry pack, ½-inch head space is sufficient. For sirup pack, allow a head space of ½ inch for short pints, 1 inch for tall pints, and 1½ inches for quart-sized containers. Fill cans nine-tenths full. Heat-seal inner liners of cartons and locker bags. Leave glass jar caps loose until product is frozen and then tighten down on rubbers.

Freezing.—Freeze promptly at 0° F., or lower, and store at 0° F.

Soybeans, Green Edible

Quality of fresh vegetable.—Edible varieties selected at optimum stage for cooking or canning may be frozen.

Preparation.—Wash the pods in cold water. Boil or steam them for 5 minutes (no further blanching is necessary). Cool in cold water and squeeze the beans out of the pods. Wash in cold running water and drain.

Packaging.—Pack dry or in brine. Any moisture-vapor-proof container is satisfactory. For dry pack, ½-inch head space is sufficient for most sizes of containers. For brine pack, allow a head space of ½ inch for short pints, 1 inch for tall pints, and 1½ inches for quart-sized containers. Fill tin cans nine-tenths full. Heat-seal inner liners of cartons and locker bags. Leave glass jar caps loose until product is frozen and then tighten down on rubbers.

Freezing.—Freeze promptly at 0° F., or lower, and store at 0° F.

Spinach and Other Greens

Quality of fresh vegetable.—Spinach, kale, mustard, and turnip and beet tops may be frozen. The greens at the harvesting period for fresh use are satisfactory. Leaves should be well colored and succulent. Only young turnip and beet greens should be frozen. After flowering has begun, leafy vegetables are not considered satisfactory.

Preparation.—Very thorough washing in running water is needed for all types of greens in order to remove grit. All tough larger stems should be removed. Small tender stems are not objectionable. Blanch in small quantities in plenty of boiling water so that leaves will not mat together. Blanch leafy vegetables for 1½ minutes. Steam blanching is not recommended because of the tendency of the product to mat. In all cases cool in cold running water moving the greens around to avoid matting of leaves during cooling. Drain as well as possible. All water cannot be removed.

Packaging.—Pack dry. Any type of moisture-vapor-proof container is satisfactory. About ½-inch head space should be allowed for expansion. Heat-seal inner liners of cartons and locker bags. Leave jar caps loose until product is frozen and then tighten down on rubbers.

Freezing.—Freeze promptly at 0° F., or lower, and store at 0° F.

Turnips and Rutabagas

Quality of fresh vegetable.—Select young and tender turnips or rutabagas fresh from the garden.

Preparation.—Cut off the tops. (Turnip tops may be frozen for greens.) Wash thoroughly and pare. Dice into ¼- or ½-inch cubes. Blanch in boiling water or steam for 2 to 3 minutes. Cool in cold running water and drain.

Packaging.—Pack without brine. Any moisture-vapor-proof container is satisfactory. About ½-inch head space is sufficient for most containers. Heat-seal inner liners of cartons and locker bags. Leave glass

jar caps loose until product is frozen and then tighten down on rubbers.

Freezing.—Freeze promptly at 0° F., or lower, and store at 0° F.

THAWING AND COOKING FROZEN VEGETABLES

Thawing should be done in the original container. On the shelf of a refrigerator a 1-pound package will thaw in about 5 to 6 hours. At room temperature about 3 hours will be needed unless an electric fan is used to blow air on the package. This will reduce the time needed for thawing to about an hour. Water-tight packages may be thawed in cold running water in about 40 minutes, or in lukewarm running water in about 20 minutes.

Dry-packed frozen vegetables need not be thawed before being put on to cook, although it may be found more desirable to thaw leafy green vegetables, such as spinach or partially to thaw asparagus. Corn on the cob is an exception. It should always be thawed, otherwise the kernels would be overcooked before the cob is hot. Brine-packed vegetables should always be thawed since they may be too salty if some of the brine is not poured off.

In cooking frozen foods the object is to bring the product to the boiling point as rapidly as possible. One method is to plunge the frozen product (dry pack) into boiling water. Another is to place the vegetables in a steamer with a small amount of boiling water and steam vigorously. Only enough water should be used in cooking to prevent burning. With a brine pack, use part of the brine in place of water. This will conserve vitamins and minerals which have leached out into the brine. In 2 or 3 minutes after the vegetables are added, break up the mass with a fork so that the heat will reach all parts evenly.

Frozen vegetables cook in about one-half to one-third the time required for fresh ones. Cooking time is measured from the time the water boils again after the food is added or with steaming from the time a heavy cloud of steam rises again. Cook only until tender. Do not overcook frozen vegetables as this will cause a loss in flavor, color, and vitamin content. Use the cooking water in order to get all possible food value. Only the amount that can be eaten at one meal should be cooked at a time. The directions for using cooked frozen vegetables in most dishes are the same as if the vegetables were cooked fresh.

PRESERVATION OF MEATS BY FREEZING

More meat is frozen than any other food. About three-fourths of all foods stored in freezer lockers are meats. Civilian per capita consumption of meat has been about 130 to 141 pounds per year. On this basis a family of five would consume 650 to 705 pounds of meat annually. The average locker will hold about 250 pounds of meat. Thus, if meats were the only products frozen, it would be necessary to replenish the supply two or three times a year in order to preserve the family's supply in a single locker.

The freezing of meat has a tenderizing effect owing to the breaking down of some of the fibrous tissue by the formation of ice crystals. Because of this, it is not necessary to age meat to be frozen at 0° F., or lower, for as long a time as that for meats handled at ordinary cold-storage temperatures. Aging beef and lamb from 7 to 15 days in chill-room temperatures of 33° to 36° F. is generally enough. Pork and veal should be cut, wrapped, and frozen as soon as cold (2 to 3 days).

In general all lean meats are suitable for freezing but it is best to freeze only the more tender steaks and roasts and to preserve the pot roasts and stew meat by canning or to use them as fresh meat. To save locker space, ham, pork shoulders, and bacon are often preserved by curing.

The more rapidly meats are frozen the better the quality of the thawed product will be. The lower and more even the storage temperature, the better the meat will keep. If long storage is to be satisfactory the maximum temperature of 0° F. should not be exceeded.

PREPARATION OF MEAT FOR FREEZER STORAGE

Selection

Animals selected for slaughtering should be in good healthy condition but need not have an excessive finish of fat. A moderate covering of fat improves the quality of the meat and helps to prevent drying out of the lean during storage. Veal has a greater tendency toward drying out than does meat of an older, more mature animal. When it is possible to have a veterinarian inspect the meat this should be done.

Slaughtering

Slaughtering may be done at any time of the year. A good clean job is essential in order to avoid contamination. Directions for dressing meat are given in USDA Farmers' Bulletins No. 1186, Pork on the Farm; No. 1415, Beef on the Farm; and No. 1807, Lamb and Mutton on the Farm. (Copies may be obtained from the U. S. Department of Agriculture, Washington 25, D. C.) A number of States also have bulletins on slaughtering. They may be obtained by writing to the State experiment station or State extension service.

Chilling

Prompt chilling of the warm, dressed carcasses is very necessary. The sooner the meat is reduced to a temperature of 38° F., the better the product will be. Chill-room temperatures of 33° to 36° are customary. If an animal is slaughtered outdoors in below-freezing weather and becomes frozen, thaw it in the chill room and proceed as usual. Carcasses should be hung so that they do not touch. This allows free air circulation for removal of heat. It is desirable to remove the leaf fat from hog carcasses. If carcasses are split in two they will chill faster.

Aging

Beef is usually held (7 to 10 days) in the 33° to 36° F. temperature of the chill room, or preferably, in a special aging room after slaughter. For thin carcasses

7 days is sufficient. Beef that is covered with a good layer of fat (well-finished) may be held for 15 days. This allows the natural enzymes in the meat to soften the connective tissues somewhat but the temperature is low enough to delay growth of spoilage bacteria. Holding for a longer time than 10 days in a damp chill room may result in the formation of an undesirable mold growth on the surface of the meat. Even if this is carefully trimmed off, stale odors may reappear when the meat is thawed. Some prefer the extra tenderness and do not mind the slight change in flavor of meat aged for as much as 20 to 30 days. Lamb is aged the same as beef. Pork and veal are processed as soon as chilled, which means the second or third day after slaughter.

Cutting

After the meat has been properly chilled and aged it is cut into portions of a size best suited to the family's needs. Compact, smoothly trimmed cuts are more easily wrapped.

Beef.—In cutting up a beef or veal carcass the tender steaks and roasts should be separated from the pot roasts, stews, and meat to be ground. The loin and rib are suitable for frying and roasting; the chuck, rump, and round for Swiss steaks and pot roasts; the thinner shanks, flank, plate, and neck for stew and ground meat. In order to save storage space it is desirable to bone the cuts when possible. Boned cuts should be trimmed and tied or sewed into compact roasts before freezing. If canning facilities are available the less tender cuts may be canned and only the best preserved by freezing.

Pork.—When they are to be preserved by freezing the ham, loin, and shoulder should be cut into roasts, steaks, or chops. The bacon strip may be trimmed for curing or cut into boiling pieces. All meat should be trimmed closely, using lean trimmings for sausage and fat trimmings for lard. If facilities are available, hams, bacon, and shoulders may be cured and smoked, thus saving freezer space. Sausage that has been warmed by grinding and mixing should be spread to chill (33° to 36° F.) overnight to allow for penetration of seasoning, when used, and to remove excess heat before packaging. Package the cold product carefully in a moisture-vapor-proof wrap. Freeze promptly and store at 0° F. If separated into individual servings place two pieces of waxed paper between each. Frozen sausage develops a strong flavor more rapidly than does unground pork. From 1 to 3 months is the safest storage period. If it is practical to thaw and season each package of sausage as it is used, the unseasoned sausage can probably be held for a longer period than the seasoned.

Lamb.—Trim the legs and shoulders into smooth roasts; cut rib and loin into chops; bone the breast, shanks, and neck for use in stew or as ground lamb. Trim leg roasts and chops smoothly so that they may be more readily wrapped.

Wrapping

In order to prevent freezer burn, a special moisture-vapor-proof locker wrapper should be used. This may

be special moisture-vapor-proof cellophane or special waxed or otherwise treated freezer-locker paper. The wrapper should be of such quality that it will not crack or become brittle at low temperatures.

In wrapping meat pull the paper tight against the meat to drive out the air, lock or seal the edges, roll back the ends snugly against the package and heat seal, tape, or tie the seams securely. (See fig. 3, p. 16.) An over-all wrap of butcher paper is often used to protect the inner wrap from punctures. Stockinets serve the same purpose and in addition squeeze the paper tight against the meat. Two sheets of waxed paper between chops and steaks that are wrapped in the same package will allow their separation without thawing. Ground or stew meat is often packaged in moisture-vapor-proof bags or lined cartons. Another method of preventing drying out is to dip the frozen meat in hot, freshly rendered lard, then cool and wrap it in butcher paper. Also, meat may be dipped in a special microcrystalline wax to form a covering to prevent drying out or freezer burn.

Sizes of packages and containers should be in proportion to the number of servings desired at one time.

Labeling

All packages should be marked with the owner's name, locker number, cut of meat, weight, and date.

Freezing

As soon as the meat has been properly wrapped, place it in the freezer and freeze at 0° F., or lower. Spread packages so that air can circulate between them. Moving air will help. Most cuts will be frozen in 8 to 12 hours at 0° F., or below.

Storage

Store at 0° F. At this temperature the following storage periods are suggested:

	Months
Sausage and ground meat.....	1 to 3
Fresh pork.....	3 to 6
Lamb and veal.....	6 to 9
Beef.....	6 to 12

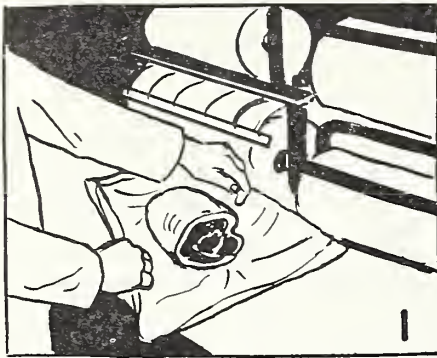
THAWING AND COOKING FROZEN MEAT

Meat need not be completely thawed before cooking. Large roasts and large steaks should be at least two-thirds thawed before cooking. There is little difference in the quality of steaks thawed before or while cooking. In cooking unthawed meat, it is best to start with a low initial temperature and make a corresponding allowance in the cooking time. Thawed meat should be cooked promptly afterward, since moist meat provides an ideal place for spoilage organisms to develop.

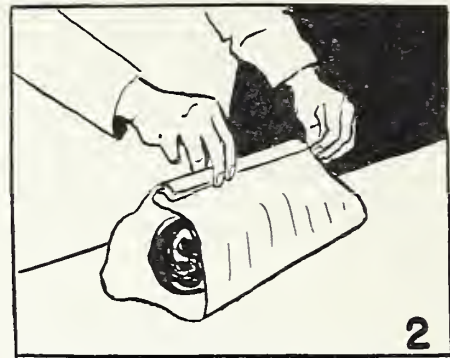
FREEZING OF POULTRY

Frozen poultry is considered as desirable as the fresh product. Through frozen storage it is possible to have broilers, fryers, or mature roasters throughout the year. Choose good, healthy, plump birds. Do not feed for 24 hours before killing, in order to empty the crop, but furnish the birds with plenty of drinking water. In

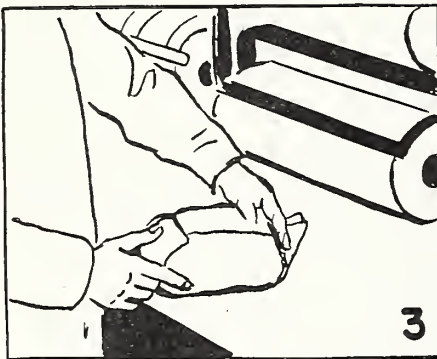
INSTRUCTIONS FOR WRAPPING MEAT AND POULTRY



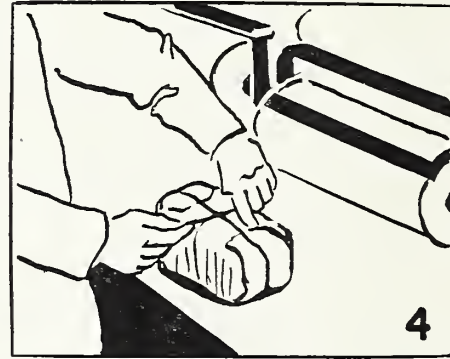
Place item to be wrapped in the center of the sheet or sheets of locker paper and/or cellophane.



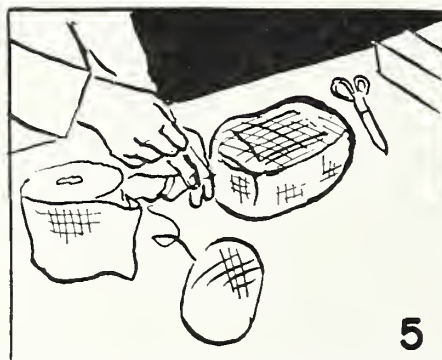
Bring two sides of the wrapping material together and make druggist or lock fold. Fold tightly and snugly to the meat or poultry.



Fold in both ends of the material so as to make a good tight wrap.



Tie with a string in both directions or use gummed locker tape.



A piece of stockinet pulled tightly around the package and tied as shown is very helpful in wrapping irregular shapes.

FIGURE 3.

order to avoid a fishy taste of the flesh it is best to withhold any fish oil from the feed for 2 weeks prior to killing.

Preparation.—Kill by cutting jugular vein and let the bird hang head down until well bled. Feathers may be removed from slaughtered birds by dry-picking or semiscalding. Semiscalding is done by holding the chicken or other fowl in water at 126° to 140° F. for 30 to 60 seconds. The longer time is used for large fowl. A closer temperature range of 126° to 130° F. is still better if it can be maintained.

Pick feathers with sufficient care to avoid tearing the skin. Remove pinfeathers, and singe. Wash with cold water. The birds should be cooled as rapidly as possible. They may be drawn before or after cooling. Poultry should not be prepared for freezing until completely cooled, because if wrapped while still warm the surface may darken and off-flavors develop.

To draw—remove head, shanks at hock joint, crop, windpipe, lungs, entrails, gall bladder, and oil gland. Special care should be taken not to break the gall bladder. Wash body cavity and giblets thoroughly in clean cold water, and drain.

Roasters.—Most of the body fat may be removed and used for other purposes if desired, since fat becomes rancid rapidly. Wrap the cold giblets and the neck in moisture-vapor-proof paper and insert in body cavity or under wing. The legs may be trussed to tail to make a more compact package if so desired. Wrap the bird in moisture-vapor-proof paper or place it in a freezer bag and seal the package. (See fig. 3, p. 16.) Wrap the package in stockinet, cheesecloth, or locker paper if cellophane is used. Another method is to dip the dressed bird in a special microcrystalline wax to form a covering to prevent drying out or freezer burn.

Broilers.—Halve the prepared birds and place the halves together with two pieces of moisture-vapor-proof paper between them. The giblets are prepared as outlined above. Wrap in moisture-vapor-proof paper, seal, and place in stockinet or freezer bag.

Fryers or Fricassee.—Cut up or disjoint the bird into portions desired so that no further preparation will be necessary before cooking. Wrap the pieces in moisture-vapor-proof paper in quantities desired for use at one time. Place in stockinet or freezer bag. Poultry may also be packed in tin containers, glass jars, or heavily waxed paper cartons.

Since the moist body cavity and cut parts of the fowl offer excellent opportunities for the development of bacteria and molds, poultry should be placed in the freezer immediately after preparation is completed. Freeze at or below 0° F. and store at 0° F.

THAWING AND COOKING OF FROZEN POULTRY

Poultry may be thawed in the package shortly before cooking, or the outer wrapper may be removed and the bird thawed more rapidly in front of an electric fan. A 3-pound bird requires about 6 to 8 hours per pound to defrost in a refrigerator. With air blowing on it

from an electric fan a 5-pound bird will thaw sufficiently in from 3 to 6 hours to remove the giblets. Turkeys, being much larger, will require a proportionately longer time. If poultry is not completely thawed it is necessary to allow extra time for cooking. Use the same methods of cooking as for freshly killed birds.

FREEZING OF EGGS

Fresh eggs may be broken and frozen during the season of abundance and used during the period of scarcity and higher prices. This has been a commercial practice for many years and would appear to be desirable for home use.

Only fresh clean eggs should be used. Dirt from shells may spoil the keeping qualities. Cracked eggs should be discarded, since they may be contaminated with bacteria.

Preparation.—Break eggs into a clean bowl—smell each egg to make sure it is fresh.

WHOLE EGG.—Add 1 tablespoonful of sugar, or corn sirup, or honey to each 2 cups of liquid eggs. Break all the yolks, mix thoroughly but do not whip in air. Another method is to mix in 1 teaspoonful of salt with each 2 cups of eggs instead of using sugar, corn sirup, or honey. The addition of these materials prevents gumminess in the thawed yolk substance.

YOLKS.—Separate yolks from the whites and for each cup of yolks add 1 tablespoonful of sugar, corn sirup, or honey, or 1 teaspoonful of salt.

WHITES.—Egg whites are frozen just as they are.

Packaging.—A ½-pint package is convenient for home use, since the eggs in the package should all be used promptly after thawing. A larger package of from ½- to 1-gallon capacity would more nearly fill school lunch and institutional needs. Pack in moisture-vapor-proof containers, heavily waxed cartons, waxed cartons with moisture-vapor-proof liners, small glass jars, or small cans such as those used for baking powder. Fill containers nine-tenths full in order to allow space for expansion during freezing. Freeze at 0° F., or lower, and store at 0° F.

THAWING AND USING FROZEN EGGS

Thaw in refrigerator, in the draft from a fan, or preferably in a dish in a pan of running water the quantity you expect to use at one time. *Thawed eggs should be used promptly.*

In general, frozen whole eggs are suitable for uses to which broken yolk eggs are commonly put. The same applies to the yolk. Eggs frozen with sugar, corn sirup, or honey should be used for cooking purposes and those frozen with salt should be used for mayonnaise or salad dressing. Frozen egg whites are just as suitable for making angel food cakes as are fresh whites. One tablespoonful of yolks equals 1 egg yolk. Approximately 2 tablespoonfuls of egg white equals the white from 1 egg.

FREEZING OF FISH

Fish that are to be frozen should be washed in pure, clean water and frozen within 4 hours after they are caught, if possible. If it is impossible to freeze them immediately they should be held on ice or in a refrigerator but never for more than 1 day.

*Preparation.*²—Prepare the fish for freezing in the same manner as for cooking. Remove the head and scales, eviscerate and wash the fish thoroughly. Cut out fins and trim off the tail if the fish is small and is to be frozen pan-dressed. Cut large fish into steaks or fillets ready for cooking.

Packaging.—Tightly wrap pan-dressed fish, or fish for roasting, in heavy moisture-vapor-proof paper, and seal. Fillets, steaks, and small fish are packed in heavily paraffined paperboard containers lined with moisture-vapor-proof paper. The liner should be heat-sealed. Laminated locker bags may also be used. Sizes of packages should be in proportion to the number of servings desired at one time.

Freezing.—Freeze promptly at 0° F., or lower, and store at 0° F.

THAWING AND COOKING FROZEN FISH

Fish may be thawed in a refrigerator or at room temperature. They may be either completely or partially thawed before cooking. Cook by the same methods used for fresh fish. If the fish are only partially thawed, however, cook them slowly and allow extra cooking time.

FREEZING OF MISCELLANEOUS PRODUCTS

Smoked hams and bacon are sometimes frozen and held in lockers. This prevents the growth of mold and other deterioration. Mild-cured hams may be held in freezing storage to insure their keeping. Smoked meats must be carefully wrapped if it is desired to keep the smoked odor away from other stored products. Use the same careful wrapping methods as for fresh meat.

The meat of large game animals, such as deer and moose, is prepared for freezing in the same manner as veal and beef.

Rabbits, squirrels, and other small game are skinned, beheaded, eviscerated, cooled, and washed. They may then be cut into pieces ready for cooking. Package in moisture-vapor-proof containers and freeze immediately.

Oysters, clams, and scallops may be frozen and stored. Wash in salt water (2 tablespoonfuls of salt to 1 quart of cold water), package in heavily waxed cartons or other watertight containers, freeze immediately at 0° F., or lower, and store at 0° F.

Butter will stay fresh longer at 0° F. than at higher temperatures. If the freezer is free from odors, any

convenient type of package will do for butter, but an airtight container is best. Sweet cream containing 40 percent or more of butterfat can be held several months at 0° F. It should first be pasteurized by holding at 170° to 180° F. for 15 to 20 minutes, cooled in cold water, and then frozen. The addition of 10 to 15 percent of sugar before freezing will prevent separation of butterfat when the cream is thawed. Heavily paraffined cardboard containers are suitable.

FREEZING OF COOKED FOOD

It is possible that the individual locker renter might find it convenient to freeze certain cooked foods for use at a later date; however, at this time there is not sufficient information available for the recommendation of any large number of such products. Baked beans, cooked chicken and turkey, meat stews, Brunswick stew, and meat and vegetable combinations are now being frozen commercially. It is best not to season cooked foods too highly, since the fresh flavor will not be retained as long as for unseasoned foods.

Sweetpotatoes, pumpkins, and rutabagas should be cooked preferably in a pressure canner. They may then be pared and sliced or pureed before being frozen.

A large number of pies may be baked at one time and frozen for future use. Mince pie is quite satisfactorily held in frozen storage. Scrapple is another product which lends itself to frozen storage. Prompt cooling of cooked foods after cooking and before freezing is necessary in order to prevent bacterial action. A good method is to set the container in cold water. This also insures faster freezing.

Package cooked foods in moisture-vapor-proof containers in the same manner as other foods which are to be stored frozen. The size of the package used should be in proportion to the amount desired for use at one time.

Freeze promptly at 0° F., or lower, and store at 0° F.

CARE OF FROZEN FOODS AFTER REMOVAL FROM THE LOCKER

An insulated container for use in protecting frozen food while it is being transported from the locker to the home is desirable. Such a container may be constructed by placing a smaller box within a larger one and filling the space in between with corrugated paperboard, excelsior, straw, or crumpled paper.

Unless frozen food can be kept frozen it should be used promptly. Thawed products which are refrozen are inferior. Vegetables should be partially cooked if they cannot be used soon after thawing. In an efficient refrigerator, at about 40° F., frozen foods may be kept as long as from 24 to 36 hours after thawing but if possible it is better to use them as soon as thawed. Frozen foods may be held a week in the freezing compartment but some slight deterioration may be noticed if held longer than that.

² Further detailed information on the preparation of fish and other sea food for freezing may be obtained from the Fish and Wildlife Service of the U. S. Department of Interior, Washington, D. C.

SANITATION

In the Operation of Any Food-Processing Plant Cleanliness Is Absolutely Essential in Order to Prevent Contamination and Loss of Valuable Food.

Even though the contaminant may not be directly injurious to health one does not like the idea of eating unclean food. Take as much pride in keeping your food-processing equipment clean as you would in keeping clean your own kitchen utensils.

Protect your plant from flies and other insects by proper screening of all doors and windows.

Provide proper disposal for all garbage so that flies will not have a place to breed, and roaches, rats, and mice will not have food upon which to live. Wash and, if possible, steam the garbage can every day. Leave the cover off until needed again so that the can has a chance to dry out thoroughly. This keeps down odors.

In food-processing plants it is regular practice to flush floors with a hose at the end of each working day. When large quantities of food are being processed it is often found necessary to flush the floors more than once a day. This may be done during mealtimes or other shut-down periods. Excess water may be swept out with a broom.

Scrub tables with hot water as often as necessary, giving them a thorough cleaning at the completion of the working period. Steaming them will help clean and serve to render the surface sterile. It is good practice to start with a clean table and end with a clean table.

Knives, peelers, pulpers, grinders, pots, and pans should be scalded after use, every day. Leave peelers, pulpers, and grinders dismantled so that they may air out.

Keep walls, woodwork, and windows clean. Keep screens free from dust. Provide clean toilet facilities. A drinking fountain is a good investment.

All operators of freezer-locker plants should be thoroughly familiar with State and municipal laws governing sanitary regulations and inspection service within the area in which they operate.

Blanching kills most of the bacteria on the surface of vegetables. During the cooling and packing operations many bacteria may be picked up from the cooling water, the table tops, and from the containers in which the vegetables are packed. Most of these bacteria are harmless to man but there is always the possibility that in an unsanitary plant some bacteria may be picked up that would produce food poisoning. Never freeze foods which show the least signs of spoilage.

Fruits are not sterile but are not likely to have harmful bacteria on them when picked. Clean handling should keep them that way.

There are two reasons for prompt handling of fruits and vegetables after harvesting. The same applies to meat after slaughtering. First, enzyme action changes flavor and texture more rapidly at high temperatures; in vegetables, blanching stops this action. Second, bacteria multiply rapidly at ordinary temperatures. Low temperatures stop bacterial growth and slow

down enzyme action almost to a standstill. There is a considerable decrease in the bacterial and mold count in frozen foods that are stored at 0° F., or lower, but the bacteria and mold fungi are never all killed.

The cleaner the job of preparation has been the fewer spoilage organisms there will be to start growing when the product is thawed.

Another reason for keeping a plant clean is to keep down odors which might be absorbed by the frozen foods. Fats have a tendency to absorb off-flavors which might make them unpalatable.

PACKAGING MATERIALS

Without proper packaging the preservation of foods by storage at low temperatures cannot be successful. Ice forms water vapor even at 0° F., which is the most common temperature for the storage of quick-frozen foods. This means that the materials used for packaging must not only be moisture proof but also vapor proof in order to prevent the drying out of the frozen foods.

Another important function of the package is to prevent changes caused by the oxygen of the air. An example of this is the browning of peaches. Oxidation may also lead to undesirable flavor changes. The basic reason for freezing is preservation of as much of the fresh flavor as possible, and without proper protection this advantage is lost.

A package should also protect the food from absorbing outside flavors and odors, and from contamination.

Containers may be waxed cartons, cartons lined with special papers, laminated bags, specially treated paper wraps, glass jars, or tin cans.

Whenever waxed cartons or papers are used the wax should be of a type which does not form cracks, at low temperatures, leading to a loss of moisture vapor from the package. The cartons may be cylindrical, tub-shaped, or rectangular.

When lined cartons are used it is important that the package be leakproof, easy to fill, and have a good seal. Rectangular cartons give greater freezing surface and, hence, faster freezing. They also take up about 33 percent less space and therefore allow more food to be stored in the locker. These cartons lined with a good moisture-vapor-proof bag which can be heat-sealed are commonly used for fruits and vegetables. The carton acts as protection for the liner and need not be made of moisture-vapor-proof material. It is usually lightly waxed to prevent excess moisture absorption.

Duplex bags have been developed which have proved to be quite successful. When properly made and sealed they are leakproof and moisture-vapor proof. The outer layer is made of wet-strength paper and the inner layer of moisture-vapor-proof material. These bags are either heat-sealed or folded with an apothecary or drug-store fold. Heat sealing is preferred.

Wrapping materials should not only be moisture-vapor proof but should also be moisture resisting so that the wrapper may be stripped from meat while still frozen without undue sticking or tearing. A

cellophane inner wrap and a locker paper outer wrap give the best protection. This combination is used for packaging meat, poultry, and fish. Special locker tapes which may be written on are often used to seal wrapped packages. Different colors may be used for each class of product, such as green for vegetables and red for meats.

Stockinet material is often used to cover wrapped packages of irregular shape, such as those of meat and poultry. The product is first wrapped in moisture-vapor-proof paper and then the stockinet is applied as protection. This material also serves to hold the paper more firmly against the wrapped product.

Carton liners, bag liners, and wrapping materials may be made of regenerated cellulose film, vegetable parchment, or chlorinated rubber sheeting. The regenerated cellulose and vegetable parchment must be treated by special processes in order to make them moisture-vapor-proof. Certain papers which have received special coatings may be used but ordinary wax paper is not sufficiently vapor-proof.

Many sizes of cartons and bags may be obtained. The most satisfactory packages for home use are the 1- and 2-pound containers (pint or quart size). The 5-pound size is best for school lunch and institutional use. Larger sizes, up to 30 pounds, are also available and may be used if not too thick to freeze rapidly.

Locker paper is sold in rolls, 14, 18, 20, and 24 inches wide, weighing about 2 pounds per inch of width. For example, a 20-inch roll would weigh 40 pounds. Cellophane comes in rolls 15 and 18 inches wide weighing approximately 45 and 54 pounds, re-

spectively. A standard roll contains approximately 5,250 linear feet.

Glass jars with tops and rubber rings may be used and if carefully handled should not break. They must not be filled too full since expansion of the produce in freezing may crack them. A head space of about 1½ inches should be left in a quart jar.

Tin cans make satisfactory containers. A square type has the advantage of best utilizing locker space. Whether a plain tinned or enameled can should be used depends on the product to be frozen. R-enameled is used to prevent the bleaching of red fruits, and C-enameled is used to prevent the discoloration of the contents and the staining of the inside of the can which may occur when sulfur-bearing vegetables and meats are packed in plain cans. Cans with slip-over or friction tops may be obtained in sizes from 5 to 10 pounds for use in freezing foods for school lunch and institutional purposes. They should have tight seams to prevent leakage and be free from rust and dirt.

Meat and poultry may be dipped in a special micro-crystalline wax to form a covering to prevent freezer burn. Special equipment has been devised to carry out this dipping process in a proper manner.

Special rubber stamps, pads, and inks are available for marking locker packages. There are also other marking materials for writing on locker paper, cellophane, and other wrapping materials used to package frozen foods. The ink used is available in red, blue, green, yellow, purple, and orange. A different color may be used to identify each type of product.

A PARTIAL LIST OF MANUFACTURERS OF SUPPLIES FOR FROZEN FOOD LOCKERS

(In furnishing this partial list of manufacturers of freezing accessories, no discrimination is intended and no guarantee of reliability is implied.)

Bags, Liners, Papers

Allied Paper Bag Corp., Baltimore, Md.
Aluminum Co. of America, Pittsburgh, Pa.
Andrews Paper House of York, York, Pa.
Betner Co., Benj. C., Devon, Pa.
Brooks Paper Co., 400 Security Bldg., Saint Louis, Mo.
Catty Corp., H. D., 237 Main St., Norwalk, Conn.
Central Paper Co., Inc., Muskegon, Mich.
Continental Bag Specialties Corp., 601 West 26th St., New York, N. Y.
Dobeckman Co., 3301 Monroe Ave., Cleveland, Ohio.
E. I. DuPont de Nemours & Co., Wilmington 98, Del.
Glacier Products, Cleveland, Ohio.
Goodyear Tire & Rubber Co., Akron, Ohio.
Jiffy Manufacturing Co., Hillside, N. J.
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
MacAdam & Co., Inc., A. E., 95 Lexington Ave., Brooklyn 5, N. Y.
Marathon Corp., Menasha, Wis.
McLaurin-Jones Co., Brookfield, Mass.
Mehl Manufacturing Co., Cincinnati, Ohio.
Milprint, Inc., Milwaukee, Wis.
Nekoosa-Edwards Paper Co., Port Edwards, Wis.
Reynolds Metals Co., Reynolds Metals Bldg., Richmond 19, Va.
Royal & Co., Thomas M., Philadelphia 20, Pa.
Schumann Equipment Co., 137 Bausman St., Pittsburgh 10, Pa.
Shellmar Products Co., Mount Vernon, Ohio.
Smith Paper Co., H. P., 5001 West 66th St., Chicago 38, Ill.
Stecher-Traung Lithograph Corp., Rochester, N. Y.
Sylvania Industrial Corp., 122 East 42d St., New York, N. Y.
Traver Corp., 358-368 West Ontario St., Chicago 10, Ill.
Twitchell, Inc., E. W., 775 Public Ledger Bldg., Philadelphia, Pa.
Yorkville Paper Co., Inc., 431 East 77th St., New York 21, N. Y.

Cartons and Containers

Betner Co., Benj. C., Devon, Pa.
Container Corp. of America, 111 West Washington St., Chicago, Ill.
Continental Can Co., New York, N. Y.
Cuyler, Otto W., Webster, N. Y.
Dixie Cup Co., Easton, Pa.

Gair Co., Inc., Robert, 155 East 44th St., New York, N. Y.
Interstate Folding Box Co., Middletown, Ohio.
Jiffy Manufacturing Co., Hillside, N. J.
Lindley Locker Box Co., Marion, Ind.
MacAdam & Co., Inc., A. E., 95 Lexington Ave., Brooklyn 5, N. Y.
Marathon Corp., Menasha, Wis.
Moist-R-Proof Container Co., Bush and Larkin Sts., San Francisco, Calif.
Royal Co., Thomas M., Philadelphia 20, Pa.
Sealright Co., Inc., Fulton, N. Y.
Seeley Tube & Box Co., Dover, N. J.
Strange Pail Co., John, Menasha, Wis.
Sutherland Paper Co., 243 East Patterson St., Kalamazoo 13-D, Mich.
Traver Corp., 358-368 West Ontario St., Chicago 10, Ill.
Twitchell, Inc., E. W., 775 Public Ledger Bldg., Philadelphia, Pa.
Yorkville Paper Co., Inc., 431 East 77th St., New York 21, N. Y.

Stockinet

Adler Co., Harrison and Queen City Aves., Cincinnati 14, Ohio.
Eagle Beef Cloth Co., 315 Christopher Ave., Brooklyn 15, N. Y.
MacAdam & Co., Inc., A. E., 95 Lexington Ave., Brooklyn 5, N. Y.
Schmidt Co., C., 1720 John St., Cincinnati 14, Ohio.
Twitchell, Inc., E. W., 775 Public Ledger Bldg., Philadelphia, Pa.
Yorkville Paper Co., Inc., 431 East 77th St., New York 21, N. Y.

Heat Sealing Equipment

Amsco Packaging Machinery, Inc., Long Island City, N. Y.
Cleveland Lathe & Machine Co., 5511 Euclid Ave., Cleveland 3, Ohio.
Karstrom Co., Paul R., 2620 South Indiana Avenue, Chicago 16, Ill.
Pack-Rite Machines, 828 North Broadway, Milwaukee 2, Wis.
Schumann Equipment Co., 137 Bausman St., Pittsburgh 10, Pa.

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- (6) MAHONEY, C. H., and WALLS, E. P.
1944. SELECTION AND PREPARATION OF VEGETABLES FOR FREEZING PRESERVATION IN LOCKER PLANTS. Md. Agr. Expt. Sta. Misc. Pub. 29, 9 pp.
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